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EXECUTIVE SUMMARY OF THE
NATIONAL COMMUNICATION OF

THE NETHERLANDS

submitted under Articles 4 and 12 of the
United Nations Framework Convention on Climate Change

In accordance with decision 9/2 of the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (INC/FCCC), the interim secretariat is to make available, in the official languages of the United Nations, the executive summaries of the national communications submitted by Annex I Parties.

Note: Executive summaries of national communications issued prior to the first session of the Conference of the Parties bear the symbol A/AC.237/NC/___.

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Copies of the national communication of
the Netherlands can be obtained from:

Ministry of Housing, Spatial Planning and Environment
Air and Energy Directorate/640
Climate Change Division
P.O. Box 30945
2500 GX The Hague
Fax No. (31 70) 339 1310

Introduction

1. The Netherlands signed the Framework Convention on Climate Change (FCCC) in 1992 at the Earth Summit (United Nations Conference on Environment and Development) in Rio de Janeiro on behalf of the Kingdom of the Netherlands. The Convention was ratified by the Netherlands' Government on December 21, 1993.

2. The Netherlands' national communication provides a broad overview of the Netherlands' climate change policies, focussing on the national reduction of greenhouse gases in 2000. Furthermore, the communication gives an overview of reduction possibilities beyond 2000. Sectors of society, provincial and municipal governments, business and industry as well as consumer and environmental groups have been involved in the policy making process. Research institutes have provided background information, forecasts and cost analyses. Policies, measures and activities, however ambitious, can be described as necessary from the climate change perspective and as being 'no regrets' policies.

National Circumstances

3. The high population density, the intensive use of land, the high level of industrialization and the location of the Netherlands in a delta of three rivers with intensive traffic lead to great demands on the environment. Natural gas is the biggest energy source in the Netherlands, accounting of almost 50 per cent of the total energy use.

4. The Netherlands' climate change policy had already been established before the FCCC was signed. In 1989 the Netherlands hosted two international conferences on global climate change. In 1989 and 1990, targets and measures were announced by the Government. These policies were developed further and updated in 1993, and have all been passed by Parliament.

Emission inventories

5. The Netherlands' inventory of greenhouse gas emissions includes the following gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), nitrogen oxides (NOx), carbon monoxide (CO), non-methane volatile compounds (NMVOCs), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). Table ES.1 and table ES.2 provide a breakdown of the 1990 emission inventory. Expressed in Global Warming Potentials (direct effects), CO_2 emissions amounted to 85 per cent of total emissions, CH_4 emissions contributed 6 per cent and N_2O emissions 9 per cent. Fuel combustion activities are the main sources of CO_2 emissions; waste and animal husbandry are the main sources for CH_4 emissions; and agricultural soils is

the main source of N_2O emissions. Removals by sinks are low in the Netherlands, and amount to less than 0.1 per cent of total CO_2 emissions. In 1993 CO_2 emissions decreased for the first time since 1990. They were about 1.5 per cent below 1992 level and are now back at where they were in 1990.

Uncertainty

6. The uncertainty in the estimates of CO_2 emissions amounts to roughly 2 per cent. The uncertainty in estimates of non-CO_2 greenhouse gas emissions is considerably higher and amounts to 30 per cent for methane emissions and 50-100 per cent for N_2O emissions.

Temperature Correction

7. For policy development and evaluation reasons, CO_2 emissions have been adjusted for temperature influences. Temperature adjustment provides a possibility to distinguish between trends in CO_2 emissions caused by changing economic circumstances, energy prices and policy measures on the one hand, and influences due to annual variations in temperature on the other.

Inventory Methodology

8. For most sources and sinks, the draft "IPCC Methodology for Greenhouse Gas Inventories" has been applied to estimate emissions. Where appropriate, emission factors specific to the situation in the Netherlands have been used. For CO_2 emissions, the aggregated fuel approach from the IPCC methodology has been applied, since it was found that differences between the aggregated and detailed methodology amounted to less than 0.1 per cent. To estimate emissions from feedstocks, a methodology based on more detailed data concerning products of feedstocks has been applied. A distinction is made between emissions from manufacturing and emissions from product use. For landfills, a time dependent method has been applied. Additional sources of N_2O emissions have been identified, such as the manufacturing of caprolactam, sewage treatment, polluted waters and background emissions from soils.

9. The IPCC methodology used to estimate CO_2 emissions differs on some points from the Netherlands' policy approach. The main difference concerns the treatment of emissions from feedstocks, waste incineration and industrial processes. The target set by the Netherlands to reduce CO_2 emissions (see next section), is based on the Netherlands' policy approach, and is therefore not comparable with the 1990 CO_2 emission estimates obtained according to the IPCC methodology. The same applies to the approach taken for projections of emissions.

Table ES.1 Netherlands' inventory of CO_2, CH_4 and N_2O emissions, 1990 (Gg)

Greenhouse Gas Source and Sink Categories	CO_2 Actual	CO_2 T-corr.[1]	CH_4	N_2O
Total National Emissions	**167,600**	**174,000**	**1,067**	**59.6**
1. All Energy			**177**	**6.1**
A Fuel Combustion	**164,800**	**171,200**	**28**	**6.1**
- Energy & Transformation	51,400	51,400	NE	0.5
- Industry	33,400	34,100	NE	0.1
- Transport	26,900	26,900	NE	5.4
- Commercial/Institutional	9,500	10,900	NE	0.04
- Residential	19,200	22,300	NE	0.06
- Agriculture/Forestry	8,600	9,700	NE	NE
- Actual emissions from feedstocks	14,800	14,800	NA	NA
- Statistical differences; rounding	1,000	1,100	NA	NA
B Fugitive Fuel Combustion	**NA**	**NA**	**149**	**NA**
- Crude oil and Natural Gas	NA	NA	149	NA
- Coal Mining	NA	NA	NO	NA
2. Industrial Processes	**1,900**	**1,900**	**NO**	**16.4**
A Iron and Steel	NO	NO	NO	NO
B Non-Ferrous Metals	NO	NO	NO	NO
C Inorganic Chemicals	NO	NO	NO	14.6
D Organic Chemicals	NO	NO	NO	1.7
E Non-Metallic Mineral Products	1,900	1,900	NO	NO
3. Solvent and Other Product Use	**NO**	**NO**	**NO**	**NO**
4. Agriculture	**NA**	**NO**	**508**	**22.1**
A Enteric Fermentation	NA	NA	402	NA
B Animal Waste	NA	NA	106	NA
C Rice Cultivation	NA	NA	NO	NA
D Agricultural Soils	NA	NA	NA	22.1
E Agricultural Waste Burning	NA	NO	NO	NO
F Savannah Burning	NA	NO	NO	NO
5. Land Use Change and Forestry	**(-120)[2]**	**(-120)[2]**	**NA**	**NA**
6. Waste	**900**	**900**	**382**	**4.1**
A Landfills	NA	NA	377	NA
B Waste water/Sewage treatment	NA	NA	5[3]	4.0
C Waste Incineration	900	900	0	0.1
7. Other				**10.9[4]**

NO = Not Occurring; NA = Not Applicable; NE = Not Estimated
Gg. = gigagram
[1] CO_2 emissions corrected for temperature influences
[2] Not included in total CO_2 emissions
[3] Including CH_4 emissions from drinking water treatment
[4] N_2O emissions from polluted inland and coastal water

Table ES.2 Total emissions of NO_x, CO, NMVOC, PFCs and HFCs, 1990 (Gg)

Gas	NO_x	NMVOC	CO	CF_4	C_2F_6	HFCs
emission (Gg)	576	459	1,029	0.516	0.052	0

Programmes, Policies and Measures

10. The Netherlands' climate policy is to a large extent a combination of different policy areas. It coordinates and reinforces policies already in place. Climate policy is basically the sum of a large number of policy areas each with their own set of policy instruments. However, the Netherlands has been working towards an integrated climate policy. Part of the national planning process involves a periodic update of policies and measures on the basis of monitoring and evaluation procedures.

11. The most important policy areas relevant to the Netherlands' climate policy include energy, transport and waste. The climate policy objectives have been integrated into the sectoral policies, that embrace other environmental objectives as well. The Netherlands follows a gas-by-gas approach to reduce greenhouse gas emissions. Under the existing national environmental policy plans, the national CO_2 target is to stabilize emissions for 1994-95, and to achieve an emission reduction of 3-5 per cent by 2000 compared to emissions in 1989-1990. In order to achieve the 3 per cent reduction, the target of an annual energy efficiency improvement of 1.7 per cent for the period 1990-2000 has been set. The Netherlands' Government will decide in 1995 whether the provisional 5 per cent emission reduction target should come into force, taking account of international developments and opportunities.

12. The CH_4 emission reduction target is 10 per cent by the year 2000 compared to the 1990 level, and the target for N_2O is to stabilize these emissions by the year 2000 compared to 1990. Targets for the reduction of emissions of NOx and NMVOCs have been set within a different policy context. The target is to reduce NOx emissions by 55 per cent by the year 2000 compared to emission levels in 1988. For volatile organic compounds (VOCs), the aim is to reduce emissions by 60 per cent by the year 2000 compared to 1988. For CO, the aim is to reduce emissions by 50 per cent by the year 2000 compared to 1990. National targets for HFCs and PFCs have not yet been set.

13. Table ES.3 provides a selection of the most important policies and measures with respect to CO_2 emissions for the Netherlands (although a slightly different sector classification is generally used in the Netherlands, the national communication follows the INC guidelines as far as possible for the sector/gas classification in the description of policies and measures).

14. As can be seen from table ES.3, the Netherlands uses a combination of policy instruments, including voluntary agreements, standards and regulations, fiscal and financial stimuli, information and research and development. In selecting appropriate instruments, preference is given to support for 'self regulation', that is, voluntary agreements. This usually takes the form of a long term agreement between the Government and intermediary organizations, such as branch organizations. The principle reason for the emphasis on voluntary agreements is to secure the acceptance of measures by all relevant participants.

15. Methane reductions are often the beneficial result of policies that are not directly related to climate, such as policies to reduce landfilling, acid deposition and manure surplus. Table ES.4 provides a summary of specific policies resulting in CH_4 emission reduction.

16. No policies have been formulated specifically aimed at reducing N_2O emissions. Reductions or increases are the result of policies in other areas than climate. For the 1990-2000 period, the main developments involve an increase in nitric acid production, reduced application of fertilizers and manure to soils, and the introduction of catalytic converters. The main part of the NOx reduction strategy is an acidification abatement policy.

17. Regulations, standards and subsidies aim to reduce NOx emissions from energy, transport and industry. VOC emissions from industry are addressed by a long term agreement. Transport policies aiming to improve the quality of vehicles also result in VOC emission reduction. CO emissions are addressed by control and technical measures in the oil, gas and industry sector and by fiscal measures to introduce catalytic converters in the transport sector.

Budgets

18. Budgets for energy conservation and renewable energy from Government and the energy distribution sector were Dfl. 516 million for 1990 and Dfl. 870 million for 1994. The newly appointed Government has announced budget cuts in this area. It has not been possible to take the consequences of this decision into account in this communication. Measures for energy conservation and renewables do not only address climate change, but the aforementioned budgets are nevertheless relevant to climate change in general. The figures also include programmes on recycling and energy use from biomass and waste, but do not include budgetary effects of fiscal incentives.

Beyond the year 2000

19. The Netherlands' longer term climate change policy recognizes the need for a further international reduction policy after the year 2000. With respect to the European CO_2 stabilization target, the Government concluded in the Second National Environmental Policy Plan that, once CO_2 emissions have been reduced by 3 to 5 per cent by the year 2000 compared to 1989/1990, in principle, no further rise in emissions should occur.

Table ES.3 Summary table of policies and measures to reduce CO_2 emissions

Sector	Instrument type	Objective/expected results	Policy/measures
Energy and transformation industries			
Electricity production sector	Consultation and making conditions	Efficiency improvement from 40 to 43 per cent between 1990 and 2000	Energy conservation in central generating capacity for electricity production
Renewable energy	Subsidies, research and development	3 per cent of energy consumption by 2000 provided by renewables	Stimulation of application of wind energy, waste incineration etc.
Transport			
Private passenger transport	Vehicle related taxes, road taxes, excises, investments in public transport, spatial planning, information and education	CO_2 emission reduction of 11 per cent by 2000 (1990 levels)	Vehicle related measures (quality improvement), limiting growth of automobility, influencing modal split, reduction of individual car use, spatial planning and parking policies
Freight traffic	Government investments (improving and extending infrastructure), efficiency and logistical measures, LTA[1]	Emission reduction of 11 per cent by 2000 (1990 levels)	Stimulation of shift in modal split by enhancing other transport facilities (rail/waterways), efficiency and logistical measures
Industry			
Manufacturing industry	Primarily LTAs[1] (aim: 90 per cent of the sector); subsidies, fiscal incentives. Information and consultancy, RD&D[2]	19 per cent energy efficiency improvement in 2000 (1989)	Energy conservation; LTAs[1] with different sub-sectors contain various measures. Measures for non-LTA[1] sectors include establishing energy-registration and control system, information on available techniques
Waste			
Waste management	LTAs[1], financial support, RD&D[2] programmes, regulation	Expected emission reduction: about 3,500 Gg annually in 2000	Preventing landfill by legislation; increasing energy benefits from disposal with energy recovery, stimulation of recycling through LTAs[1]

Residential and commercial			
Commercial/Institutional	Regulation (standards), subsidies, LTAs[1] Information and consultancy, RD&D[2] Fiscal incentives	23 per cent energy efficiency improvement by 2000 (1989)	Energy conservation by means of: energy efficiency standards for new buildings, energy efficiency programme for Government buildings, LTAs[1] with commercial sector to improve energy efficiency
Household	Regulation, resource pricing, LTAs[1], subsidies, standards, information and consultancy	23 per cent energy efficiency improvement by 2000 (1989)	Energy conservation by means of LTAs[1] with subsidized housing sector, higher insulation standards and energy efficiency standards
Agriculture and forestry			
Agriculture	LTAs[1], Subsidies, fiscal incentives, information and consultancy, RD&D[2]	26 per cent energy efficiency improvement by 2000 (1989)	Energy conservation by means of LTAs[1] e.g. with greenhouse horticulture
Land use change and forestry	Subsidies, Government finance	Afforestation of 75,000 ha over 25 years (1994)	Extension of the forest area through subsidies for farmers to change activities to forestry, Government afforestation projects and development of 'carbon credit' system
Other policies and measures			
CO_2 capture and disposal	Research and development		Demonstration project to investigate possibilities to storing CO_2 in depleted gasfields
Cross sectoral			
Cogeneration	Subsidies, demonstration projects	Capacity of 8000 Mw by 2000	Cogeneration, district heating recovery of industrial heat
Energy distribution sector	LTAs[1] between government/energy distribution sector (Second environmental action plan-MAP 2);	CO_2 reduction in 2000 of 17,000 Gg (1990); energy conservation by 2000 of 195 PJ (1990)	Stimulate energy conservation in households, commercial and institutional buildings and small and medium sized businesses; stimulating savings on end use, cogeneration and renewables
Technology development	Subsidies and grants		Formation of technology clusters drawn from manufacturing industry, technological institutes and energy sector

1 LTA - long term agreement
2 RD & D - research, development and demonstration

Table ES.4 Policies and measures to reduce CH_4 emissions

Gas/ Sector	Instrument type	Objective/ expected results	Policy/measures
Waste Management	Regulation (Soil Protection Act/ Decree on Waste Disposal at landfills)	Expected emission reduction (including additional policies) is 154 Gg by 2000	Recovery of CH_4, followed by incineration and/or energy recovery
Agriculture	Regulations for manure	Expected emission reduction: 35 Gg resulting from manure policy and 10 per cent from Common Agricultural Policy (1990-2000)	Decreasing number of cattle and manure production as a result of Netherlands' manure policy and the European Common Agricultural Policy
Fugitive fuel emissions	Instruments applied within energy policy.	Expected emission reduction is 20 per cent (1990-2000)	Measures taken within energy policy. Replacement of gas distribution networks and improved maintenance.

Projections

20. Estimates of future trends in greenhouse gas emissions are based on scenarios that take account of developments in the world economy and the economic situation in the Netherlands. Table ES.5 provides some key assumptions used in the models. The Energy Policy Scenario is used for forecasting CO_2 emissions for the period up to the year 2000. The European Renaissance Scenario and the Global Shift Scenario have been applied to estimate future trends for the other greenhouse gases as these emissions are less dependent on changes in energy prices and economic growth rates. Table ES.6 provides emission estimates for the years 1990 and 2000.

Table ES.5 Some key assumptions in various scenarios

	Energy Policy Scenario	ER-high Scenario	GS-low Scenario
Annual rate of economic growth (per cent) 1990-2000 period	1.9	2.7	1.5
End user price of energy in the year 2000 (1990 = 100)	100	123	100
Effects of structural change[1] (per cent)	- 0.1	- 0.2	0.2

[1] Annual rate of change in the ratio 'energy consumption/gross national product (GNP)' due to changes in economic structure.

Table ES.6 Future trends for greenhouse gas emissions, 1990 - 2000 (Gg)

Gas	1990	2000
CO_2[1]	174,000	167,600
CH_4[2]	1,067	786
N_2O[2]	59.6	62.2
NO_x[2]	576	366
CO[2]	1,029	630
NMVOC[2]	459	245

[1] Temperature corrected. Based on Energy Policy Scenario.
[2] Based on ER-High Scenario.

21. Table ES.6 shows that a CO_2 emission reduction of approximately 4 per cent is expected by the year 2000 compared to 1990 levels. Since the effectiveness of current policies will lessen after the year 2000, while economic growth will probably continue, the scenarios show that, without further policy changes, total CO_2 emissions will increase in the period after 2000.

22. According to the Netherlands' policy approach (see section 3), given the current economic outlook and the effects of other policies, including the possible introduction of a CO_2 energy tax within the European Union or on a national level, the CO_2 target of 3 per cent reduction is within reach.

23. A reduction in methane emissions is often the beneficial result of policies that are not directly related to climate, such as policies to reduce landfilling, acid deposition and manure surplus. CH_4 emissions are expected to decrease by about 25 per cent by the year 2000, which is considerably more than the target of 10 per cent reduction compared to 1990. A further decrease is expected after the year 2000.

24. N_2O emissions are expected to increase by 5 per cent by the year 2000 instead of remaining stable at 1990 levels. Options to limit N_2O emissions in the Netherlands are currently being explored. NOx, CO and NMVOC emissions are expected to decrease considerably in the next decades. Options to further reduce these emissions and to reduce fluorocarbon emissions are being studied.

Assessments of total effects of measures

25. The Netherlands' evaluation process does not make a distinction between policies implemented before 1990 and those implemented after. Furthermore, in projecting future trends of greenhouse gas emissions, no distinction is made between policy induced and autonomous effects on emissions. Therefore, it is difficult to provide separate estimates of the total effect of measures, policies and programmes on the emissions of the various greenhouse gases.

26. It is expected that energy conservation will reduce CO_2 emissions by approximately 42,000 - 45,000 Gg compared to a scenario without energy conservation. This figure also includes the effects on CO_2 emissions of anticipated changes to the fuel supply pattern. These effects have been estimated to reduce CO_2 emission by about 7,000 - 9,000 Gg. In these figures no distinction is made between policy induced and autonomous effects on energy conservation. The most important measures to reduce CH_4 emissions are listed in table ES.4. The total effect of these measures is a methane emission reduction of about 280 Gg by the year 2000 compared to 1990 (approximately 25 per cent). Policies related to transportation, agriculture and the production of nitric acid are expected to cause a net emission increase of about 2.5 Gg N_2O.

Vulnerability and Adaptation

27. Given its geographical situation, the Netherlands is highly susceptible to changes in sea level and related changes caused by extreme weather and hydrological conditions. Adaptation to these climate changes may eventually incur additional costs arising from measures such as raising dikes, protecting flood-prone infrastructure, preservation of dunes and adaptation of the water management. The present institutional and economic situation enables the country to cope with the effects expected; however, this may be at the expense of nature value. The Netherlands has considerable experience in the area of coastal zone management, and has worked to share this experience with other countries, in particular with those developing countries that are most vulnerable to the effects of climate change.

Joint Implementation

28. The Netherlands' government has shown considerable interest in joint implementation (JI). In June 1994, the Netherlands hosted an international conference on joint implementation. The Netherlands emphasizes the importance of a limited trial period on the basis of preliminary criteria to be established by COP 1. The Netherlands' Government announced the development of a programme of pilot projects (PPP) to gain experience with joint implementation. It intends to present the PPP following a COP decision.

Finance and international cooperation

29. For 1994, the Netherlands has committed a contribution of 1.5 per cent of the net national income to development aid. At UNCED, the Netherlands announced that the budget allocated for the promotion of environmentally sound development in developing countries will reach a total of a. .ost Dfl. 450 million per annum by 1997. The Netherlands also committed itself to provide, in addition to current commitments for development cooperation which now substantially exceed the 0.7 per cent GNP target, new and additional financial resources up to a maximum of 0.1 per cent GNP for the implementation of global environmental agreements, including the UNFCCC, provided that other countries take a similar course in generating resources for an earth increment. A contribution of approximately Dfl. 90 million has been made to the pilot phase of the Global Environment

Facility up to 1994. The Netherlands' contribution to the second phase (1994 to 1996) will be 3.57 per cent (Dfl. 125 Million) of the total target of approximately US $ 2 billion. Several bilateral and multilateral assistance programmes have been developed for developing countries and countries with economies in transition. These include country study programmes (including emission inventories, vulnerability assessment and mitigation), energy efficiency programmes, renewable energy programmes and support for tropical forestry action plans.

Research and Systematic Observation

30. Research on climate change and climate-related issues is carried out by universities, governmental and non-governmental research institutes and large technical institutes. Several national research programmes have been developed e.g., the National Research Programme on Global Air Pollution and Climate Change (NRP), which aims to strengthen the involvement of Netherlands' research in national and international programmes; the Global Change Programme of the Netherlands' Organization of Scientific Research; and the National Remote Sensing Programme. Expenditures on energy and climate policy-related energy RD&D amounts to more than Dfl. 700 million per annum, 50 per cent of which is covered by the Government. Priority in energy RD&D policy is given to fuel cell technology, wind energy, coal gasification, photovoltaic solar energy, small scale gas conversion technology and energy conservation.

Education, Training and Public Awareness

31. In the Netherlands, awareness raising campaigns are the most important tools for involving the general public in issues concerning climate change. Since 1990, several campaigns have been conducted, including a campaign aimed specifically at climate change and energy, an energy conservation campaign by the energy distribution sector and awareness-raising campaigns for traffic and transport. All the stages of the climate change campaign have been evaluated. Special emphasis is attached to communication between researchers, policymakers and the general public in order to facilitate the policymaking process. Other relevant projects are those by intermediary organizations aimed at specific target groups, and research into means of reducing the energy intensity of lifestyles.

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EXECUTIVE SUMMARY OF THE
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Copies of the national communication of New Zealand can be obtained from:

Ministry for the Environment
P.O. Box 10362
Wellington
Fax No. (64 4) 471 0195

1. Global climate change is regarded as a serious concern by the New Zealand Government. New Zealand began its response to climate change in 1988 with the establishment of the New Zealand Climate Change Programme. The Government's policy responses have since been brought together under the Comprehensive Strategy on Climate Change which aims to address sources and sinks of all greenhouse gases. The Government's current domestic target, consistent with the Framework Convention on Climate Change (FCCC), is to return net anthropogenic emissions of carbon dioxide (CO_2) to their 1990 level by 2000, and to maintain them at that level beyond the turn of the century. New Zealand retains its ultimate objective of reducing net carbon dioxide emissions to 20 per cent below their 1990 levels, subject to certain conditions, including cost-effectiveness, not reducing our competitive advantage in international trade, and having a net benefit to New Zealand society.

2. This first Framework Convention on Climate Change (FCCC) communication indicates that New Zealand is already well on track to achieve both these objectives. It also demonstrates that we expect to achieve a reduction in methane (CH_4) emissions of up to 8 per cent and stabilisation at least of perfluorocarbon (PFC) emissions. Given uncertainties in estimates of nitrous oxide (N_2O), we are unable at present to calculate trends in emissions of that gas. Our efforts are therefore fully consistent with FCCC provisions and goals, including those for Annex 1 Parties. New Zealand is also fully meeting its obligations as an Annex II Party in respect to finance.

Emissions and sinks

3. Overall, New Zealand's net emissions of greenhouse gases are declining **(see figure 2.1, page 7 of New Zealand's first national communication)**. Net emissions of carbon dioxide will be 50-59 per cent below 1990 levels in 2000. Methane emissions will also be below 1990 levels by 2000 and emissions of perfluorocarbons (PFCs) will be stable. Although there is considerable uncertainty concerning nitrous oxide emissions these are not expected to rise over the decade.

4. In 1990 New Zealand emitted 25 530 gigagrams (Gg) (or 25.5 million tonnes) of carbon dioxide. The combustion and transformation of fossil fuels accounted for 90 per cent of these emissions (22 769 Gg). The remainder was made up of carbon dioxide emissions from industrial processes.

5. The largest source of carbon dioxide emissions in New Zealand is the transport sector which accounted for 34 per cent of the total carbon dioxide emissions in 1990. (This estimate uses IPCC methodology; transport accounts for over 40 per cent using Ministry of Commerce methodology). Electricity generation and other transformation activities (including gas used in the petrochemicals industry) accounted for 27 per cent of the total. Carbon dioxide emissions from industrial processes contributed 10 per cent of the total, with fuel combustion in the industrial, commercial/industrial and agriculture/forestry sectors

accounting for 17 per cent, 5 per cent, and 4 per cent of the total respectively. The remaining emissions (less than 4 per cent) came from the residential sector, fugitive fuel, and other sources.

6. Oil contributed around 52 per cent of total energy sector carbon dioxide emissions, with the main source, the transport sector, accounting for 72 per cent of the emissions. Gas and coal accounted for 34 per cent and 14 per cent respectively.

7. Forestry absorption of carbon dioxide was estimated to be 16716 Gg in 1990. This figure takes account of an estimated 1255 Gg of carbon dioxide that was emitted through forest clearing and fires.

8. Agriculture is New Zealand's main source of methane. Ruminants themselves accounted for around 71 per cent of total methane emissions of 2112 Gg. Landfills, other waste management systems, and fossil fuel sources (mainly from leakages and fuel combustion) made up the remainder.

9. The agricultural sector was also the main source of nitrous oxide emissions. Between 1 and 37 Gg of nitrous oxide was estimated to have been emitted from agricultural soils. Fossil fuel combustion was responsible for a further 7 Gg. Total emissions of nitrogen oxides (NO_x) are estimated to have been around 145 Gg in 1990, with the major source being the transport sector. Practically all emissions of nitrogen oxides were related to fuel combustion activities. It is estimated that New Zealand also emitted 0.1 Gg of perfluorocarbons (PFCs) in 1990. In the same year New Zealand imported less than 20 kg of HFC-134a and approximately 120 tonnes of HFC-152a.

10. Table 2.1 below summarises emissions and absorption of the main greenhouse gases in New Zealand in 1990.

Greenhouse Gas Source and Sink Categories	**CO_2**	**CH_4**	**N_2O**	**NOx**
Total (Net) National Emission	*(All figures in Gg)*			
1. All energy (Fuel Combustion + Fugitive)	23 040	61	7.5	145
2. Industrial Processes	2 490			
3. Agriculture		1 618	1-37	
4. Land Use Change and Forestry	-16 716			1
5. Waste		433	1	

Table 2.1 Summary of 1990 New Zealand greenhouse gas emissions and absorptions.
Source: Ministry for the Environment

Policy measures and their effect on future emissions

11. It is expected that in the absence of policy measures New Zealand's carbon dioxide emissions would have risen by around 18-22 per cent and 35-40 per cent over 1990 levels by 2000 and 2005 respectively under the modelling assumptions detailed in Chapter 7 **(see figure 2.2, page 9 of New Zealand's first national communication)**. Within these "business-as-usual" (BAU) assumptions it is projected that the share of emissions among sectors would have remained fairly static over the outlook period.

12. Although New Zealand's gross emissions of carbon dioxide are expected to grow, it is important to recognise that the current emission profile is relatively low because of the significant contribution of renewables to the energy mix. Renewable energy contributes about 75 per cent of the country's electricity needs. While there is scope to develop further renewable energy capacity, particularly wind power, predicted future energy requirements mean some increase in power generation from fossil fuels is necessary. Nuclear power is not an option.

13. The New Zealand Government has introduced a number of policy measures which are expected to limit carbon dioxide emissions. These include:

- Use of the Resource Management Act 1991 (RMA) to consider carbon dioxide emissions in plans, policy statements, and resource use consents;
- Legislative and regulatory reform in the energy sector encouraging more competitive gas and electricity markets;
- The Energy Efficiency Strategy -- a range of measures to facilitate the uptake of cost-effective energy efficient practices and technologies, and to help overcome barriers to the development of economically viable renewable energy resources;
- Cooperative energy efficiency programmes between the Energy Efficiency and Conservation Authority (EECA) and industrial and commercial firms, and between EECA and public sector organisations such as schools, hospitals, and departments, to improve energy use in these sectors;
- Renewable energy measures and the removal of barriers to encourage greater uptake of renewable sources of energy, particularly wind and biomass;
- Voluntary agreements with industry to reduce carbon dioxide emissions;
- Specific transport sector measures including taking carbon dioxide into account in regional transport strategies and road funding, speed limit enforcement, and driver education.

In total the measures described above are expected to reduce growth in carbon dioxide emissions by around 20 per cent of the "business-as-usual" growth by 2000. In addition, the Government has announced a further measure:

- The introduction of a low-level carbon charge in 1997 if at mid-1997 it is assessed that the reduction in emissions is not on track to achieve the specified target level by 2000.

14. The Government has decided that the emission reduction target which will determine whether or not a carbon charge is to be introduced is, for any gross domestic product (GDP) growth rate, that level which results in emission reductions contributing 20 per cent, and sink absorption contributing 80 per cent, towards stabilisation of emissions at 1990 levels.

15. The target reduction corresponds to emissions growth of 14.2 per cent above 1990 carbon dioxide emission levels should GDP growth average 2 per cent; and if GDP growth averages 3 per cent, a target of emissions growth of no more than 17.3 per cent above 1990 levels.

Measures to increase carbon dioxide sinks

16. In 2000, New Zealand's planted forests are projected to remove 25 519 Gg of carbon dioxide from the atmosphere. Carbon stored in natural and planted forests in New Zealand is at least 100 times greater than the net annual carbon absorption level. The forests are therefore a substantial carbon reservoir as well as a significant carbon sink. In 1994, the new forest planting could reach 135 000 hectares. It is expected that on average 100 000 hectares of new forest will be planted each year at least until 2005. The projections estimate (using methodology similar to that of the Intergovernmental Panel on Climate Change (IPCC)) the net amount of sequestration which will take place 2000.

Measures to limit methane emissions

17. In addition the Government also expects to limit methane emissions. It is not yet possible to quantify the outcome of a research programme investigating the potential for lowering ruminant methane emissions through manipulation of enteric bacteria. Methane emissions from livestock in 2000 are expected to be 1425 Gg, about 8 per cent below 1990 levels, and methane em. sions from landfills are expected to be at or below 1990 levels in 2000.

Adaptation

18. Most adaptation measures are being taken by local authorities. At present these have concentrated on coastal policy and natural hazard mitigation.

Finance and technology

19. New Zealand has agreed to contribute NZ$10.4 million (SDR 4 million) for the 1994-1996 replenishment to the Global Environment Facility (GEF). Roughly half of this amount is an assessed share. The remainder is a supplementary contribution.
New Zealand is also making an ongoing contribution to mitigation and adaptation work through its Official Development Assistance (ODA) programme. In 1993-1994, ODA expenditure on such activities through bilateral, regional, and other multilateral channels was in excess of NZ$ 8.5 million.

Research

20. New Zealand takes its responsibilities for research and monitoring related to climate change very seriously. A National Science Strategy Committee on Climate Change (NSSCCC) has been appointed by government to provide advice and coordination on climate change science issues. Climate change research also has priority research theme status for funding from the Public Good Science Fund. National expenditure on climate change research within Crown Research Institutes (CRIs) and universities in the 1993-1994 financial year is estimated as NZ$14,100,000 (US$8,200,000).

Education, training, and public participation

21. The Government has produced material on climate change for the general public, schools, and specialised audiences. There have been opportunities for public participation in the development of policy and during resource consent processes.

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